R E M A R K S

The amendments to the specification correct minor typographical errors. No new matter is believed to be added to the application by this Amendment.

Status of the Claims

Claims 1, 3-33 and 35-46 are pending in the application. Claims 2 and 34 have been canceled by this Amendment. Claims 41-46 are new. Support for the amendments to claims 1, 33, 35 and 36 can be found in canceled claims 2 and 34, and find additional support at pages 6 and 8 of the specification. The amendments to claims 17 and 18 correct minor typographical errors, and do not restrict the scope of these claims. Support for newly added claims 41-46 can be found in claims 27-32, respectively.

Election/Restriction (Paragraphs 1-5 of the Office Action)

The Examiner has required restriction of the claims of the invention into the following two groups:

I. Claims 1-18 and 33-36, drawn to an organic waveguide, classified in class 385, subclass 143.

II. Claims 19-32 and 37-40, drawn to a manufacturing method for an organic waveguide, classified in class 264.

Further to the telephone conversation with the Examiner on June 15, 2001, Applicants elect group I (claims 1-18 and 33-36)

with traverse. The organic waveguide of group I and the method of manufacturing the organic waveguide of group II are so intimately related that the search of one group would automatically encompass the search of the other group. Accordingly, no undue burden is placed upon the Examiner. As a result, rejoinder of both groups and examination of all the claims of the invention on the merits is respectfully requested.

Rejection Under 35 U.S.C. §102(b) Over Matsuura '201 (Paragraphs 8-9 of the Office Action)

Claims 1, 7, 9, 11 and 13 are rejected under 35 U.S.C. §102(b) as being anticipated by Matsuura '201 (US Patent 5,108,201). Applicants traverse this rejection, and respectfully request reconsideration and withdrawal thereof.

Claim 1, as amended, incorporates subject matter from canceled claim 2. Canceled claim 2 is free of the rejection over Matsuura '201. As a result, claim 1, as amended, is patentable for at least this reason alone. Further, claims 7, 9, 11 and 13, being dependent upon independent claim 1, are additionally patentable for at least this reason alone.

Further, claim 1, as amended, incorporates a limitation that is neither disclosed nor suggested by Matsuura '201. Amended claim 1 recites "a clad section covering an upper surface of the core section." However, the Examiner asserts "Matsuura discloses

a polyimide waveguide with all the limitations set forth in the claims, including a core made of polyimide with a silicon oxide and cladding layer." See Office Action at paragraph 9. However, Matsuura '202 at column 11, lines 37-40, discloses the upper cladding layer as the clad section and a lower cladding layer, of which the upper cladding layer is analogous to the clad section of the present invention. Although the Examiner contends that Matsuura '201 discloses using a silicon oxide film for the clad section, however, the layer of the silicon oxide film is of Matsuura's lower cladding layer. As a result Matsuura '201 does not disclose using an inorganic dielectric for the upper cladding layer. Therefore, Matsuura '201 fails to disclose or suggest the present invention for at least this reason alone.

As has been shown, Matsuura '201 fails to anticipate the present invention for at least two independent and distinct reasons. Accordingly, this rejection is overcome, and withdrawal thereof is proper.

Rejection Under 35 U.S.C. §102(b) Over Yamamoto '406 (Paragraphs 11-13 of the Office Action

Claims 1, 15, 17, 33, 35 and 36 are rejected under 35 U.S.C. §102(b) as being anticipated by Yamamoto '406 (US Patent 5,406,406). Applicants traverse this rejection, and respectfully request reconsideration and withdrawal thereof.

Independent claims 1, 33 and 36, as amended, contain the subject matter of canceled claim 2. Independent claim 35 already contains the subject matter of canceled claim 2. This subject matter (the cladding layer being formed by sputtering, CVD, or vapor deposition) is not disclosed by Yamamoto '406. Indeed, the Examiner admits at paragraph 17 of the Office Action that Yamamoto '406 "does not specify the use of a silicon oxide layer formed by a sputtering, CVD or vapor deposition method."

Further, at paragraph 13 of the Office Action, the Examiner asserts that product-by-process claims fail to have patentable weight. However, MPEP 2173.05(p) clearly states "A product-by-process claim, which is a product claim that defines the claimed product in terms of the process by which it is made, is proper. *In re Moeller*, 117 F.2d 565, 48 USPQ 542 (CCPA 1941); *In re Luck*, 476 F.2d 650, 177 USPQ 523 (CCPA 1973); *In re Steppan*, 394 F.2d 1013, 156 USPQ 143 (CCPA 1967); and *In re Pilkington*, 411 F.2d 1345, 162 USPQ 145 (CCPA 1969)."

Accordingly, Yamamoto '406 fails to anticipate instant claims 1, 15, 17, 33, 35 and 36. Therefore, withdrawal of this rejection is respectfully requested.

Rejections Under 35 U.S.C. 103(a) Based Upon Yamamoto '406 (Paragraphs 14-31 of the Office Action)

Claims 2, 7, 8, 16, 18 and 34 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yamamoto '406 in view of Eda '540 (US Patent 5,485,540). Claims 3 and 4 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yamamoto '406 in view of Eda '540, and further in view of Losch '568 (US Patent 5,940,568). Claims 5 and 6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yamamoto '406 in view of Eda '540, and further in view of Ishiharada '088 (US Patent 5,692,088). Claims 9-14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yamamoto '406 in view of Eda '540, and further in view of Maruo '619 (US Patent 5,572,619). Applicants traverse these rejections, and respectfully request reconsideration and withdrawal thereof.

The Present Invention and Its Advantages

The present invention pertains to an organic waveguide having a core section made of organic polymer and a clad section made of inorganic dielectric which is formed so as to cover the upper surface of the organic polymer core section.

The geometrical arrangement of the organic waveguide of the present invention permits the use of technologies to create the organic dielectric which were previously not possible when organic polymer was used. That is, the present invention allows the use

of sputtering, CVD or vapor deposition to form the inorganic dielectric. As a result, the clad section can be easily made into the same shape as the core section without forming a thick overclad on the sides of the organic waveguide. This results in the easy integration with other optical elements on the same substrate, and a simpler manufacturing process results.

Further, the clad section can also be used as a mask when processing the core section, and therefore, there is no requirement for a step of removing a mask after processing the core section. As a result, there is a reduced number of manufacturing steps to make the organic waveguide.

Distinctions of the Present Invention Over the Prior Art

Yamamoto '406 pertains to molecular crystal and wavelength conversion devices that may comprise a core and a clad wherein the organic crystal is used as the core. See Abstract of Yamamoto '406. Yamamoto '406 at column 5, lines 20-30 discusses an arrangement in which a clad having smaller refractive index than the core may be formed from glass and organic substances such as photocurable adhesive. Figure 7 of Yamamoto '406 shows the clad on both surfaces of the core.

Yamamoto '406 fails to disclose or suggest the clad section covering an upper surface of the core. Yamamoto '406 fails to

disclose or suggest the clad section being formed by sputtering, CVD, or vapor deposition.

That is, the technology of Yamamoto '406 does not allow the use of sputtering, CVD or vapor deposition, and thus cannot easily form the clad section in the same shape as the core section. As a result, Yamamoto '406 does not allow the advantageous effects of integration with other optical elements on the same substrate and a result in simpler manufacturing process.

At paragraph 12 of the Office Action, the Examiner asserts that Yamamoto '406 discloses the use of an adhesive layer 3 between the core and cladding sections. However, Yamamoto '406 at column 10, lines 2-4 (see also Figure 7 of Yamamoto '406) discusses an adhesive polymer 3 being provided to bond two glass substrates making up the clad section. As a result, the adhesive of Yamamoto '406 is not for preventing separation of the core section and the clad section. Further, Yamamoto '406 does not form the clad section by sputtering, CVD or vapor deposition, and thus Yamamoto '406 fails to address the problem of separation. Therefore, it is clear that Yamamoto '406 uses a fundamentally different technology to produce their molecular crystal and wavelength conversion devices.

Accordingly, a person having ordinary skill in the art would not be motivated to use any of the teachings of Yamamoto '406 to produce an embodiment of the present invention.

Eda '540 fails to address the deficiencies of Yamamoto '406 in suggesting an embodiment of the present invention. Eda '540, in Figure 21 and example 20, discusses forming a clad layer 52 of silicon oxide on the core section (waveguide portion 3) by a CVD method. However, Eda '540 fails to utilize a core section made of organic polymer. As a result, a combination of the teachings of Eda '540 and Yamamoto '406 would result in a device having poor adhesion between the core section and clad section and these sections would usually separate from each other. In contrast, the present invention solves this problem by providing the adhesive layer between the core section and the clad section (see claims 15 and 16) thereby foregoing this problem. As a result, a combination of Eda '540 with Yamamoto '406 would fail to motivate a person having ordinary skill in the art to produce a claimed embodiment of the present invention, and the *prima facie* case of obviousness has not been made. Accordingly, withdrawal of this rejection is proper.

Losch '568 pertains to a planar optical waveguide wherein the cladding layer is patterned in such a way that UV laser light directed to the waveguide forms an optical interference pattern in the core. See Abstract of Losch '568. In the Office Action, the Examiner turns to the teachings of Losch '568 for the utilization of a cladding layer as a mask. However, the Examiner fails to demonstrate how the teachings of Losch '568 address the failures

of Yamamoto '406 in suggesting an embodiment of the present invention. Additionally, the Examiner fails to point out where in the references themselves the teaching or suggestion to combine the references may lie. As a result, the teachings of Losch '568 cannot be combined with those of Yamamoto '406 to produce the *prima facie* case of obviousness. As a result, withdrawal of this rejection is proper.

Maruo '619 pertains to a polyimide optical waveguide. However, Maruo '619 fails to address the deficiencies of Yamamoto '406 and Eda '540 in suggesting an embodiment of the present invention. As a result, the combination of Maruo '619, Eda '540 and Yamamoto '406 are insufficient to assert *prima facie* obviousness. Accordingly, withdrawal of this rejection is proper.

As has been shown, the teachings of Yamamoto '406 in combination with any or a combination of the secondary references is insufficient to assert *prima facie* obviousness. Accordingly, Applicants respectfully request withdrawal of all the obviousness rejections based upon Yamamoto '406.

Information Disclosure Statement

Applicants thank the Examiner for considering the Information Disclosure Statement filed November 22, 1999, and making the initialed PTO-1449 Form of record in the application in the Office Action mailed July 3, 2001.

Conclusion

If the Examiner has any questions concerning this application, he is requested to contact Robert E. Goozner, Ph.D., Reg. No. 42,593, at (703) 205-8000 in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____ #32,868
Raymond C. Stewart
Reg. No. 21,066

P. O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

RCS/REG/gml
Attachment: Version with Markings to Show Changes Made

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The paragraph beginning on page 21, line 10, has been rewritten as follows:

In the silane [contained] containing polyimide, the silicon component is not etched in RIE with an oxygen gas and remains, which causes residue. Thus, generation of residue can be suppresses using the polyimide containing no silane.

The paragraph beginning on page 24, line 14, has been rewritten as follows:

As the organic polymer, fluorinated polyimide was used, and as the adhesive layer, siloxylated polyimide (adhesive) was deposited in a thickness of around 500Å by [spincoating] spin coating before depositing the inorganic dielectric as the masking clad 4. Then, the organic waveguide was formed in accordance with the described steps.

The paragraph beginning on page 39, line 1, has been rewritten as follows:

After the organic polymer is subjected to [thermalpolymerization] thermal polymerization, there is a case where active functional groups on the surface may be reduced, and

in particular when fluorinated polyimide is used as the organic polymer, the adhesion between the organic polymer layer and the adhesive layer becomes weak after imidization by [thermalpolymerization] thermal polymerization. Thus, by forming the adhesive layer before the organic polymer is subjected to [thermalpolymerization] thermal polymerization as described above, it is further ensured that the adhesion between the organic polymer layer and the inorganic dielectric layer is improved.

IN THE CLAIMS:

Claims 2 and 34 have been canceled.

The claims have been amended as follows:

1. (Amended) An organic waveguide comprising:

a core section made of organic polymer; and

a clad section covering an upper surface of the core section and made of inorganic dielectric having a lower refractive index than that of the core section, the clad section being formed by sputtering, CVD or vapor deposition.

17. (Amended) The organic waveguide as set forth in claim 15, wherein the adhesive layer is formed before the organic polymer to be the core section is subjected to [thermalpolymerization.] thermal polymerization.

18. (Amended) The organic waveguide as set forth in claim 16, wherein the adhesive layer is formed before the organic polymer to be the core section is subjected to [thermalpolymerization.] thermal polymerization.

33. (Amended) An optical part in which an organic waveguide and an optical element [such as] selected from the group consisting of a photo-emitting element, photo-receptive element, and lens are formed on a single substrate,

said optical part having an organic waveguide which includes a core section made of organic polymer and a clad section covering an upper surface of the core section and made of inorganic dielectric having a lower refractive index than that of the core section, the clad section being formed by sputtering, CVD or vapor deposition.

35. (Amended) An optical part in which an organic waveguide and an optical element [such as] selected from the group consisting of a photo-emitting element, photo-receptive element, and lens are formed on a single substrate,

said optical part having an organic waveguide which is manufactured by a manufacturing method which includes [the] a step of forming an inorganic dielectric layer to be a clad section on an organic polymer layer processed into a core section

so as to cover an upper surface of the core section, the inorganic dielectric layer being formed by a CVD method, sputtering method, or vapor deposition method.

36. (Amended) An optical part in which an organic waveguide and an optical element [such as] selected from the group consisting of a photo-emitting element, photo-receptive element, and lens are formed on a single substrate,

said optical part having an organic waveguide which is manufactured by a manufacturing method which includes the steps of:

forming an organic polymer layer which becomes a core section[by processing];

forming an inorganic dielectric layer to be a clad section [on] covering an upper surface of the organic polymer layer, the inorganic dielectric being formed using sputtering, CVD or vapor deposition;

processing the inorganic dielectric layer into a shape covering only an upper surface of the core section; and

processing the inorganic dielectric layer into the core section by dry etching using as a mask the inorganic dielectric layer[processed].

Claims 41-46 have been added.